WO9920071

Publication Title:

DATA TRANSFER BETWEEN GRAN INTERWORKING UNITS

Abstract:

Abstract of WO 9920071

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
H04Q 7/38, 7/24, H04L 12/56

A1

(11) International Publication Number: **WO 99/20071**

(43) International Publication Date: 22 April 1999 (22.04.99)

(21) International Application Number: PCT/SE98/01783

(22) International Filing Date: 2 October 1998 (02.10.98)

(30) Priority Data:
9703697-4 10 October 1997 (10.10.97) SE

(71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).

(72) Inventors: RUNE, Johan; Motionsvägen 5, S-181 30 Lidingö (SE). LAGNEBORG, Johan; Bergtorpstigen 42, S-125 51 Älvsjö (SE).

(74) Agent: ERICSSON RADIO SYSTEMS AB; Common Patent Dept., S-164 80 Stockholm (SE).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

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(57) Abstract

The present invention relates generally to the problem of mobility in the Generic Radio Access Network (GRAN), and more particularly to the problem of updating core-network specific information with a minimum of consumed radio resources when a mobile terminal moves to an area covered by a new radio network controller (RNC). When the GRAN informs the old Interworking Unit (IWU) that its access port is no longer valid for a certain subscriber, the acknowledgement message form the old IWU comprises an optional, variable-length field for core network specific data. The IWU inserts the core network specific identifier for this subscriber in this field. This information is then able to be forwarded to the new IWU without interpretation by the GRAN. The new IWU can then perform the core network location update on behalf of the terminal. In this way the subscriber's terminal is not involved and precious radio resources are spared.

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DATA TRANSFER BETWEEN GRAN INTERWORKING UNITS

FIELD OF THE INVENTION

The present invention relates generally to the problem of mobility in the Generic Radio Access Network (GRAN), and more particularly to the problem of updating core-network specific information with a minimum of radio resources when a mobile terminal moves to an area covered by a new radio network controller (RNC).

RELATED ART

A Generic Radio Access Network ("GRAN") can be described as a radio access network with a generic interface to which any type of core network (e.g. GSM, ISDN, PSTN, Internet, etc.) can connect. See Figure 1. The basics of a GRAN have been described in PCT/SE96/00510, "METHOD AND ARRANGEMENT FOR INCREASING THE RANGE FOR A TELECOMMUNICATION NETWORK IN A TELECOMMUNICATION SYSTEM." It is part of the ongoing development of a Universal Mobile Telecommunications System ("UMTS") within the European Telecommunications Standards Institute ("ETSI").

UMTS has been described as a 'third-generation' mobile communications system, as compared with current mobile systems like GSM which are referred to as 'second-generation.' UMTS is a broadband multimedia system that will support all that current wired and wireless technology can offer and have the ability to support new applications that are common to both, or unique to UMTS. Thus, UMTS is seen as a way of facilitating the convergence of wired and wireless networks as seamlessly as possible.

In terms of today's technology, UMTS can be thought of as having many different faces: PLMN, PSTN, wireless PABX, wireless LAN, RLL, private mobile radio, satellite systems, paging networks, mobile data networks, etc. Since the UMTS aids access between these networks, parts of the UMTS 'network' will be installed and operated by competing telecommunications operators. Other parts will be under private ownership. It is therefore foreseen that roaming between different zones under different ownership, probably resulting in a changing tariff scheme, will be supported in the UMTS environment.

One result of UMTS is that the access network responsible for communication with terminals over the air interface may be independently owned and operated from those who own and operate as service providers. For example, a GSM user may access the GSM network through an independent access network in the UMTS. Similarly, a customer of the PSTN at home may also access the PSTN through the same, or perhaps a different, access network.

There will thus be a need in the UMTS of a radio access network with a generic interface to which any type of core network can connect. That is the concept of the GRAN, as described in PCT/SE96/00510 and shown in Figure 1. The mobile cellular network may be owned and operated by an access provider, the GRAN operator, by providing access to the service providers over the air interface. The GRAN operator will have no subscribers of its own, but will be merely providing access to the core network service providers for their subscribers.

Each of the core networks will be able to access the cellular network, the GRAN, through one or more 'access ports' as shown in Figure 1 and Figure 2. These access ports will then be connected to Radio Network Controllers ("RNC") which control the

various base stations in the cellular network. The individual subscribers to the various service providers will be provided access to their service provider through appropriate base stations.

A diagrammatic view of this system can be seen in Figure 2. Future core networks may be tailored to fit the generic interface, but existing core networks will have to use an interworking unit ("IWU") between itself and the GRAN. The terminals used while accessing the GRAN will consist of one part that logically belongs to the GRAN and a second part that logically belongs to the core network.

Core network subscribers can access their respective core network through the GRAN, which is done using bearer services that the GRAN offers the core networks. Thus, two major purposes of the GRAN are to extend the ranges of existing core networks and to provide wireless access and mobility to their subscribers.

As mentioned above, the GRAN has no subscribers. Only the core network service providers have subscribers. The GRAN is also independent of the service control signalling used by the service providing operators. It does, however, provide basic terminal control, including: idle mode control, basic access with control establishment to the service providing network associated with the terminal and service, and resource control with handover control and performance.

Between the core networks and the GRAN there are interworking functions. These interworking functions can be regarded as belonging to either the GRAN, the core networks, or neither of them. The interworking functions provide mapping between core network specific and GRAN specific identifiers and parameters.

For core networks without support for terminal mobility, a certain subscriber is always accessed through the same access port e.g. 100. For core networks which do support terminal mobility a subscriber can be accessed through any of the access ports, e.g. 100 or 101, to which the core network is connected. Normally the one that provides the shortest route through the GRAN will be used. The GRAN's internal mobility management will be used to support the local mobility, while the mobility management of the core network will be used to realise a change of access port in the core network.

In this situation where the mobility management of the core network is able to change access ports certain problems arise. The IWUs contain translation data to map core-network specific identifiers and GRAN-specific identifiers. When the access port is changed for a subscriber, the mapping data for that subscriber must be moved from the IWU at the old access port e.g. 100 to the IWU at the new access port e.g. 101.

Existing core networks do not have this capacity, therefore the GRAN must be able to accomplish the transfer of subscriber, core network-specific, data. Since the GRAN concept is relatively new, there are no existing methods to deal with this problem. However, it is envisioned that the mobility management protocol of the core network should go transparently through the GRAN between the core network and the core network-specific part of the terminal.

Each terminal that will be able to access its core network through the GRAN will have a core network-specific part e.g. 70a and a GRAN-specific part e.g. 70b. The designation of the two parts in Figure 2 serves merely to illustrate the logical separation between the two parts of the terminal. The GRAN-

specific part will be responsible for all contact with the GRAN and for all signalling for bearer services between the core network and the core network-specific part of the terminal.

The core network-specific part of the terminal will take care of everything else, e.g. call setup, terminal to core network signalling, etc. The core network-specific part of the terminal will also be responsible for a core network location update according to the standard procedures of the core network. For a change of access port between calls, as would occur in a core network location update, this would mean that the core network-specific part of the terminal would initiate and perform a core network location update. In that procedure it would transfer its identity to the new IWU. The GRAN specific part of the mapping data would be transferred directly from the GRAN.

The problem with this is that it consumes scarce radio resources. Radio resources would be consumed at several stages. First, to inform the terminal that it has entered a new core network location area (corresponding to a change of access port), if this is not clear from broadcast system information, and that a core network location update should be performed. Second, to set up the radio connection which will be used to convey core network mobility management messages in the core network location update. Finally, the actual transfer of the location update message and acknowledgement between the core network-specific part of the terminal and the core network.

SUMMARY OF THE INVENTION

The present invention relates generally to the problem of mobility in the Generic Radio Access Network (GRAN), and more particularly to the problems discussed above. The means of

solving these problems according to the present invention are summarized in the following.

As has been seen above, there is a problem that exists in the current concept of a Generic Radio Access Network ("GRAN"). This problem is that whenever a terminal 70, as shown in Figure 2, moves to an area covered by a new access port 100, 101, a core network location update must be performed, and this requires a transfer of data from the old IWU, e.g. 110, to the new IWU, e.g. 111. This potentially leads to a waste of radio resources.

Accordingly, it is one object of the present invention to eliminate the use of radio resources to transfer the translation data from the old IWU, e.g. 110, to the new IWU, e.g. 111. When the GRAN 60 informs the old IWU 110 that its access port 100 is no longer valid for a certain subscriber, the acknowledgement message from the IWU 110 comprises an optional, variable-length, field for core network 50 specific data. The IWU 110 inserts the core network 50 specific identifier for the concerned subscriber, possibly along with other core network 50 specific data in this field.

The data in this field is not interpreted by the GRAN 60, but is transferred from the old RNC e.g. 120 to the new RNC e.g. 121, along with other data that needs to be transferred between the RNCs 120, 121, and then forwarded to the new IWU 111. The new IWU 111 can then send the relevant core network location update message to the core network 50. In this way the core network location update can be performed without involving the terminal, which is another object of the present invention.

Although the invention has been summarized above, the method according to the present invention is defined according to appended claim 1. Various embodiments are further defined in

dependent claims 2 through 14. A system according to the present invention is defined in appended claim 15 with further embodiments being defined in dependent claims 16-22.

Although this invention is mainly considered for transfer of mapping data initiated by a location update, it is to be understood by anyone skilled in the art that other types of user specific data may also be considered.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in more detail with reference to preferred embodiments of the present invention, given only by way of example, and illustrated in the accompanying drawings, in which:

FIG. 1 is a drawing of a cellular mobile communications system where several service providers provide services over a cellular network operated by an access provider.

FIG. 2 is a diagram of the system of shown in Figure 1.

FIG. 3 is a flowchart illustrating the steps of the method in the preferred embodiment of the present invention.

DETAILED DESCRIPTION

The present invention addresses a situation that can occur in systems using a GRAN 60 as shown in Figure 2 wherein a core network 50 supports terminal mobility. Although it is possible to support mobility throughout the GRAN 60 while always accessing the core network 50 through the same access port 100, 101, the preferred situation is to use the shortest route from the mobile terminal 70 through the GRAN 60 to the core network 50.

This involves changing access ports 100, 101, for a subscriber when that particular subscriber moves to an area covered by an RNC 120, 121, connected to a new access port 100, 101. For example, in Figure 2 the mobile terminal 70 has just moved to the area covered by the second RNC 121 from the area covered by the first RNC 120.

When a subscriber is located in a particular area covered by a particular RNC e.g. 120 in the GRAN 60, the IWU 110 for the core network 50 connected to the same access port 100 contains translation data that is used to map core network-specific identifiers and GRAN-specific identifiers. When the access port 100 is changed for a subscriber terminal, in Figure 2 the terminal has changed to a new access port 101, the mapping data relevant for that particular subscriber must be transferred to from the IWU 110 at the old access port 100 to the IWU 111 at the new access port 101.

The method of the present invention is initiated when the GRAN-specific part 70b of the terminal 70 contacts, step 300, the new RNC 121 to perform a GRAN 60 location update. The terminal 70 will, as part of this contact with the new RNC 121, transfer, step 310, its GRAN specific temporary identity to the new RNC 121, which will later also transfer, step 360, it to the new IWU 111, or generate a new GRAN specific temporary identity and transfer it to the new IWU 111 and to the GRAN specific part of the terminal.

The next step is for the new RNC 121 to contact the old RNC 120, step 320, to notify it that the terminal 70 has moved to a new location. The old RNC 120 will then send a message, step 330, to the old IWU 110 telling it that the mapping data it has for this particular terminal 70 identity is no longer valid.

The old IWU 110 will then send an acknowledgement message, step 340, to the old RNC 120. As part of this acknowledgement message, the subscriber identity is added. Because the RNC 120, 121, is part of the GRAN 60, it normally has no knowledge regarding subscriber information, such as the subscriber identity. This information is normally stored on the core network 50 side of the access port 120, 121, e.g. in the IWU 110, 111.

The old RNC 120 will then forward, step 350, the subscriber identity, along with GRAN-specific information, to the new RNC 121. The new RNC 121 will then forward, step 360, the subscriber identity along with the temporary identity to the new IWU 111.

The new IWU 111 now has both identities, subscriber and temporary. It next contacts, step 370, the core network 50 and performs a core network location update on behalf of the terminal. This core network location update is performed according to the standard procedures of the core network 50.

The embodiments described above serve merely as illustration and not as limitation. It will be apparent to one of ordinary skill in the art that departures may be made from the embodiments described above without departing form the spirit and scope of the invention. The invention should not be regarded as being limited to the examples described, but should be regarded instead as being equal in scope to the following claims.

WHAT IS CLAIMED IS:

1. In a Generic Radio Access Network (GRAN) serving as possible information bearer for at least one core network having a plurality of subscribers with mobile terminals, said core network supporting mobility to its subscribers, where each of said subscriber mobile terminals consists of one GRAN specific part that logically belongs to the GRAN, and one core network specific part that logically belongs to the core network, a method for transferring core network specific information from a first Interworking Unit(IWU) connected to a first access point between said GRAN and said core network to a second Interworking Unit (IWU) connected to a second access point between said GRAN and said core network, said method comprising

sending a message including core network specific information from said first IWU to the Radio Network Controller (RNC) at the GRAN side of said first access point; and

forwarding said core network specific information, without interpreting it to said second IWU.

2. The method of Claim 1 wherein said method further comprises the steps of:

adding an information field in a first message from said first IWU transmitted to a first RNC, said first RNC serving base stations associated with said first access point;

routing at least an indication of said first message, including said information field, from said first RNC to a second RNC, said second RNC controlling base stations associated with said second access point; and

forwarding from said second RNC said information field from said first IWU to said second IWU wherein said information field is forwarded uninterpreted by both said first and second RNCs.

3. The method of Claim 1 further comprising the steps of:

transmitting a first message from a GRAN specific part of a mobile terminal to a second Radio Network Controller (RNC) connected by way of a second access port to said second IWU wherein said first message is an indication to send a request for user specific information to a first RNC connected by way of a first access port to said first IWU, said second RNC transmitting a second message to said first RNC wherein said second message includes a request for user specific information from said first IWU upon a request from said first RNC, transmitting said user specific information from said first IWU to said first RNC;

forwarding said user specific information, upon reception, from said first RNC to said second RNC; and

forwarding said user specific information, upon reception, from said second RNC to said second IWU.

4. The method of Claim 3 wherein the step of sending a first message further comprises the step of

registering a GRAN specific identifier in said second RNC.

5. The method of claim 4 wherein said transmission of said user specific information is is further characterized by

being initiated by a location area change from a first location area associated with said first Radio Network Controller (RNC),

to a second location area associated with said second Radio Network Controller (RNC) of said mobile terminal.

6. The method of claim 5 further characterized in that said second message contains information about said location area change.

7. The method of claim 3 further characterized in that

said user specific information is core network subscriber specific information

8. A method according to claim 7 further characterized wherein

the transfer of user specific data further includes the step of transferring from said first IWU to said second IWU core network identity of a subscriber terminal or a subscriber.

9. The method of claim 7 further characterized wherein

said request from said first RNC to said first interworking unit comprises a message containing information about said location area change.

10. The method of claim 9 wherein the step of transmitting from said first interworking unit further comprises

transmitting an acknowledgment message to said first RNC, wherein said acknowledgment message includes an information field which is transferred uninterpreted by said first and second RNCs.

11. The method of claim 10 wherein the step of forwarding from second RNC to second interworking unit further comprises

forwarding said information field.

12. The method of claim 11 wherein the step of forwarding from second RNC to second interworking unit further comprises

forwarding a temporary identity from said second RNC.

13. The method of claim 12 further comprising the step of;

transmitting, upon reception of said core network subscriber specific information and said temporary identity in said second interworking unit, from said second interworking unit to said core network of said mobile terminal an indication of access port change.

14. The method of Claim 1 wherein the step of forwarding said core network specific information without interpretation is further characterized in that

said forwarding is performed via other RNCs in the GRAN.

15. In a Generic Radio Access Network (GRAN) serving as possible information bearer for at least one core network having a plurality of subscribers with mobile terminals, said core network supporting mobility to its subscribers, where each of said subscriber mobile terminals consists of one GRAN specific part that logically belongs to the GRAN, and one core network specific part that logically belongs to the core network, a system for transferring core network specific information from a first Interworking Unit(IWU) connected to a first access point between said GRAN and said core network to a second Interworking Unit (IWU) connected to a second access point between said GRAN and said core network, said system comprising

means for sending a message including core network specific information from said first IWU to the Radio Network Controller (RNC) at the GRAN side of said first access point; and

means for forwarding said core network specific information, without interpreting it to said second IWU.

16. The system of Claim 15 wherein said system further comprises:

means for adding an information field in a first message from said first IWU transmitted to a first RNC, said first RNC serving base stations associated with said first access point;

means for routing at least an indication of said first message, including said information field, from said first RNC to a second RNC, said second RNC controlling base stations associated with said second access point; and

means for forwarding from said second RNC said information field from said first IWU to said second IWU wherein said information field is forwarded uninterpreted by both said first and second RNCs.

17. The system of Claim 15 further comprising:

means for transmitting a first message from a GRAN specific part of a mobile terminal to a second Radio Network Controller (RNC) connected by way of a second access port to said second IWU;

means for forwarding said user specific information, upon reception, from said first RNC to said second RNC; and

means for forwarding said user specific information, upon reception, from said second RNC to said second IWU.

18. The system of Claim 17 further comprising

means for registering a GRAN specific identifier in said second RNC.

19. The system of claim 18 further comprising

means for transmitting an acknowledgment message to said first RNC, wherein said acknowledgment message includes an information field which is transferred uninterpreted by said first and second RNCs.

20. The system of claim 19 further comprising

means for forwarding said information field.

21. The system of claim 20 further comprising

means for forwarding a temporary identity from said second RNC.

22. The system of claim 21 further comprising;

means for transmitting, upon reception of said core network subscriber specific information and said temporary identity in said second interworking unit, from said second interworking unit to said core network of said mobile terminal an indication of access port change.

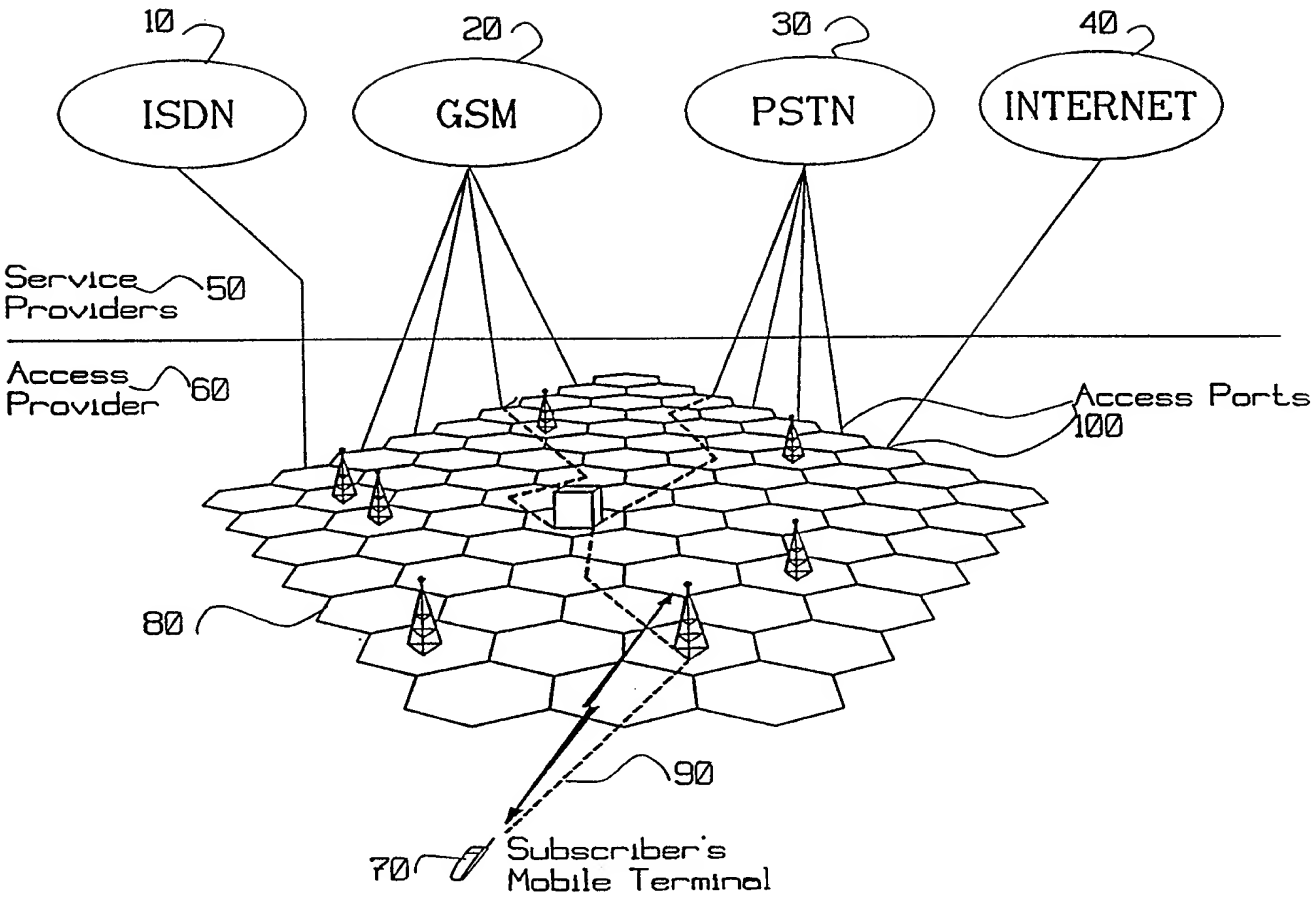
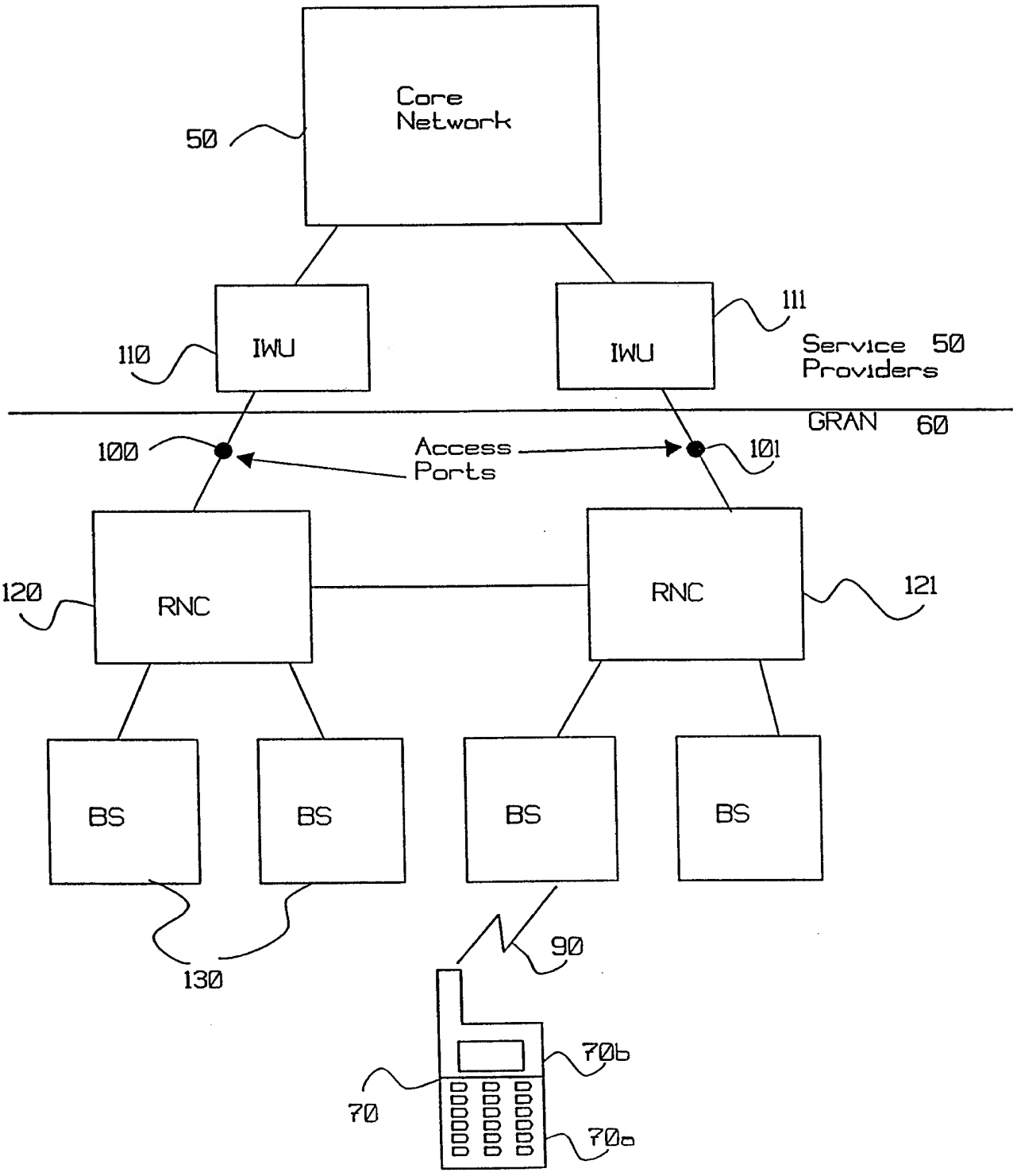

10
20
30
40
ISDN
GSM
PSTN
INTERNET
Service Providers
50
Access Provider
60
Access Ports
100
80
90
70
Subscriber's Mobile Terminal

FIG. 1


Core Network
50
IWU
110
IWU
111
Service Providers
50
GRAN
60
100
Access Ports
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RNC
120
RNC
121
BS
BS
BS
BS
130
90
70b
70
70a

Fig. 2

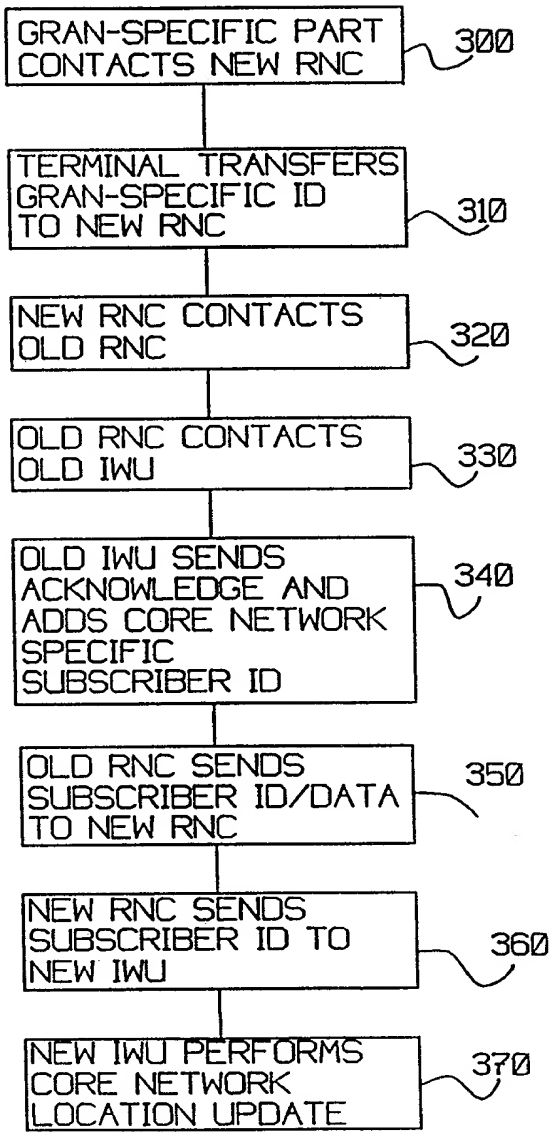
GRAN-SPECIFIC PART CONTACTS NEW RNC
300
TERMINAL TRANSFERS GRAN-SPECIFIC ID TO NEW RNC
310
NEW RNC CONTACTS OLD RNC
320
OLD RNC CONTACTS OLD IWU
330
OLD IWU SENDS ACKNOWLEDGE AND ADDS CORE NETWORK SPECIFIC SUBSCRIBER ID
340
OLD RNC SENDS SUBSCRIBER ID/DATA TO NEW RNC
350
NEW RNC SENDS SUBSCRIBER ID TO NEW IWU
360
NEW IWU PERFORMS CORE NETWORK LOCATION UPDATE
370

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 98/01783

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38, H04Q 7/24, H04Q 12/56
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9716936 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 9 May 1997 (09.05.97), page 3, line 10 - page 6, line 8, abstract --	1,15
A	WO 9634504 A1 (TELEFONAKTIEBOLAGETLM ERICSSON), 31 October 1996 (31.10.96), page 4, line 15 - line 25; page 6, line 25 - line 34; page 18, line 24 - page 19, line 18 --	1,15
A	EP 0697798 A2 (AT&T CORP.), 21 February 1996 (21.02.96), column 1, line 54 - column 2, line 28; column 3, line 19 - line 41; column 4, line 45 - column 5, line 15 --	1,15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 98/01783

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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